Designation: F3042 – 13 (Reapproved 2018)

Standard Specification for Nonferrous Hex Socket, Slotted Headless, and Square Head Set Screws[1]

This standard is issued under the fixed designation F3042; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the requirements for nonferrous socket set screws sizes 0.125 (#5) through 2.000 in., square head set screws sizes 0.190 (#10) through 1.500 in., and slotted headless set screws 0.125 (#5) through 0.750 in. in diameter manufactured from a number of nonferrous alloys in use in the marine industry and the U.S. Navy subject to seawater wetting and salt atmosphere but that also may be used in other applications. It is recommended that copper-based alloys not be used in attempting to prevent mechanical components from rotating, such as locking shafts, because of the low hardness of the alloys. Some alloys or sizes or both of set screws may not be readily available. Manufacturers or suppliers should be contacted before design development or anticipated procurement.

1.2 *Units*—The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 1—A complete metric companion to Specification F3042 will be developed—F3042M; therefore, no metric equivalents are shown in this specification.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

B154 Test Method for Mercurous Nitrate Test for Copper Alloys

E18 Test Methods for Rockwell Hardness of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry

E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)[3]

E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[3]

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)[3]

E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)[3]

E120 Test Methods for Chemical Analysis of Titanium and Titanium Alloys (Withdrawn 2003)[3]

E165 Practice for Liquid Penetrant Examination for General Industry

E350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E354 Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys

E384 Test Method for Microindentation Hardness of Materials

E478 Test Methods for Chemical Analysis of Copper Alloys

[1] This test method is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.04 on Nonferrous Fasteners.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

E1409 Test Method for Determination of Oxygen and Nitrogen in Titanium and Titanium Alloys by Inert Gas Fusion
F788/F788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series
F1470 Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

2.2 *ASME Standards:*[4]

ASME B1.1 Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B18.3 Socket Cap, Shoulder and Set Screws, Hex and Spline Keys (Inch Series)
ASME B18.6.2 Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws Inch Series

2.3 *SAE Standards:*[5]

AMS2485 Coating, Black Oxide
AMS2487 Anodic Treatment of Titanium and Titanium Alloys Solution pH 12.4 Maximum
AMS2488 Anodic Treatment—Titanium and Titanium Alloys Solution pH 13 or Higher
J2656 Fastener Part Standard—Hexagon Socket, Square Head, and Slotted Headless Set Screws—Inch Dimensioned

2.4 *Federal Standards and Specifications:*[6]

QQ-N-286 Nickel-Copper-Aluminum Alloy, Wrought (UNS N05500)

3. Classification

3.1 The designation of the alloys of this specification shall be consistent with the nonferrous designations in Table 1.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity (number of screws);

4.1.2 Name of the screw (hex socket set screw, slotted headless set screw, or square head set screw);

4.1.3 Dimensions, including nominal thread designation, thread pitch and fit, nominal screw length (inches), and point configuration. A standard part number in accordance with a nationally recognized organization or society may be used for this definition;

4.1.4 Alloy number;

4.1.5 Stress relieving, if required;

4.1.6 If titanium is not to be coated;

4.1.7 Black oxide coating, if required (not recommended);

4.1.8 Shipment lot testing, as required;

4.1.9 Source inspection, if required;

4.1.10 Certificate of compliance or test report, if required;

4.1.11 Additional requirements, if any, to be specified on the purchase order (see Supplementary Requirements); and

4.1.12 ASTM International specification and year of issue.

4.2 *Example*—50 000 pieces, 0.250-20 × 0.375 cone point, nickel copper socket set screw, stress relieved, ASTM F3042–13.

5. Materials and Manufacture

5.1 *Materials:*

5.1.1 The screws shall be manufactured from material having a chemical composition conforming to the requirements in Table 1 and capable of developing the required mechanical properties for the specified alloy in the finished fastener.

5.1.2 The starting condition of the raw material shall be at the discretion of the fastener manufacturer but shall be such that the finished products conform to all of the specified requirements.

5.2 *Manufacture:*

5.2.1 *Forming*—The screw may be forged, cold or hot formed, or machined from suitable material at the option of the supplier to meet requirements.

5.2.2 *Condition*—The fasteners shall be furnished in the following conditions:

Alloy	Condition
Copper (all alloys)	As formed or stress relieved at manufacturer's option
Nickel alloys:	
400 and 405	As formed or stress relieved at manufacturer's option
500	Solution annealed and aged
625	Annealed
686	As formed
Titanium	As formed

5.2.3 *Stress Relieving*—When required, stress relieving shall be specified by the purchaser for nickel alloys 400 and 405 and all copper alloys.

5.2.4 *Threads*—Unless otherwise specified, the threads shall be rolled or cut at the option of the manufacturer.

6. Chemical Composition

6.1 The analysis of the screw material shall conform to the chemical composition specified in Table 1.

6.2 *Manufacturer's Analysis*—When test reports are required on the inquiry or purchase order (see 4.1.8), the manufacturer shall make individual analyses of randomly selected finished fasteners from the product to be shipped and report the results to the purchaser, except as provided in 6.3.2. Alternatively, if heat and lot identities have been maintained, the analysis of the raw material from which the fasteners have been manufactured may be reported instead of product analysis.

6.3 *Product Analysis:*

6.3.1 Product analyses may be made by the purchaser from finished products representing each lot. The chemical composition thus determined shall conform to the requirements in Table 1.

6.3.2 In the event of disagreement, a referee chemical analysis of samples from each lot shall be made in accordance with 11.1 and 11.1.1.

7. Mechanical Properties

7.1 The hardness limits from Table 2 shall be met as determined using Test Methods E18.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

[6] Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

TABLE 1 Chemical Requirements

Composition, %

Copper and Copper-Base Alloys

UNS Designation Number	Alloy	General Name	Aluminum	Copper, min	Iron, max	Manganese, max	Nickel, max	Phosphorus	Silicon	Zinc, max[A]	Lead, max	Tin	Arsenic, max
C26000	260	brass	. . .	68.5-71.5	0.05	. . .	. . .	. . .	. . .	balance	0.07	. . .	. . .
C27000	270	brass	. . .	63.0-68.5	0.07	. . .	. . .	. . .	. . .	balance	0.10	. . .	. . .
C27400	274	brass	. . .	61.0-64.0	0.05	. . .	. . .	. . .	. . .	balance	0.10	. . .	. . .
C46200	462	naval brass	. . .	62.0-65.0	0.10	. . .	. . .	. . .	. . .	balance	0.20	0.5-1.0	. . .
C46400	464	naval brass	. . .	59.0-62.0	0.10	. . .	. . .	. . .	. . .	balance	0.20	0.5-1.0	. . .
C61300	613	aluminum bronze	6.0-7.5	[A]	2.0-3.0	0.10	0.15[B]	0.015	0.10	0.05	0.01	0.20-0.50	. . .
C61400	614	aluminum bronze	6.0-8.0	88.0[C]	1.5-3.5	1.0	. . .	. . .	. . .	. . .	. . .	. . .	. . .
C63000	630	aluminum bronze	9.0-11.0	78.0[C]	2.0-4.0	1.5	4.0-5.5	. . .	0.25 max	. . .	. . .	0.20 max	. . .
C65100	651	silicon bronze	. . .	96.0[C]	0.8	0.7	. . .	. . .	0.8-2.0	1.5	0.05	. . .	. . .
C65500	655	silicon bronze	. . .	94.8[C]	0.8	1.5	0.6	. . .	2.8-3.8	1.5	0.05	. . .	. . .
C66100	661	silicon bronze	0.25 max	94.0[C]	0.25	1.5	. . .	. . .	2.8-3.5	1.5	0.20-0.8	. . .	. . .

Nickel and Nickel-Base Alloys

UNS Designation Number	Alloy	General Name	Aluminum	Carbon, max	Chromium	Copper[D]	Iron, max	Manganese, max	Nickel[D]	Phosphorus, max	Silicon, max	Titanium	Cobalt, max	Molybdenum	Sulfur, max	Vanadium	Tungsten
N04400	400	Ni-Cu Class A	. . .	0.3	. . .	balance	2.5	2.0	63.0-70.0	. . .	0.5	. . .	[E]	. . .	0.024	. . .	. . .
N04405	405	Ni-Cu Class B	. . .	0.3	. . .	balance	2.5	2.0	63.0-70.0	. . .	0.5	. . .	[E]	. . .	0.025-0.060	. . .	. . .
N05500	500	Ni-Cu-Al	2.30-3.15	0.25	. . .	balance	2.0	1.5	63.0-70.0	. . .	0.5	0.35-0.85	[E]	. . .	0.01	. . .	. . .
N06625	625[F]	Ni-Cr-Mo-Cb	0.40 max	0.010	20.0-23.0	. . .	5.0 max	0.50 max	58.0 min	0.015 max	0.50 max	0.40 max	1.00 max	8.0-10.0	0.015 max	. . .	3.2-4.2
N06686	686	Ni-Cr-Mo-W	. . .	0.010 max	19.0-23.0	. . .	5.0 max	0.75 max	balance	0.04 max	0.08 max	0.02-0.25	. . .	15.0-17.0	0.02 max	. . .	3.0-4.4

Titanium and Titanium-Base Alloys[G]

UNS Designation Number	Alloy	General Name	Aluminum, Al	Carbon, C	Iron, Fe	Titanium, Ti	Hydrogen, H	Nitrogen, N	Oxygen, O	Palladium, Pd	Vanadium, V	Chromium, Cr	Molybdenum, Mo	Zirconium, Zr	Tin, Sn	Silicon, Si	Ruthenium, Ru	Residuals[H]	
																		each, max	total, max
R55111	32	Titanium Ti-5-1-1-1	4.5-5.5	0.08	0.25	balance	0.0125	0.03	0.11	. . .	0.6-1.4	. . .	0.6-1.2	0.6-1.4	0.6-1.4	0.06-0.14	. . .	0.1	0.4
R56401	23	Titanium Ti-6Al-4V ELI	5.5-6.5	0.08	0.25	balance	0.0125	0.05	0.13	. . .	3.5-4.5	. . .	. . .	. . .	. . .	. . .	. . .	0.1	0.4
R58640	19	Titanium Ti-38-6-44	3.0-4.0	0.05	0.30	balance	0.0200	0.03	0.12	0.10[I]	7.5-8.5	5.5-6.5	3.5-4.5	3.5-4.5	. . .	. . .	0.10[I]	0.15	0.4

[A] Copper plus specified elements = 99.8 min; copper plus silver = 88.5–91.5.
[B] Cobalt is to be counted as nickel.
[C] Minimum content of copper plus all other elements with specified limits shall be 99.5 %.
[D] Elements shown as balance shall be arithmetically computed by deducting the sum of the other named elements from 100.
[E] Cobalt is to be counted as nickel.
[F] Alloy 625 material shall be refined using the electroslag remelting process (ESR) or the vacuum arc remelting process (VAR).
[G] All reported values are maximums, unless a range is specified.
[H] A residual is an element present in a metal or an alloy in small quantities inherent to the manufacturing process but not added intentionally. Residual elements need not be reported unless a report is specifically required by the purchaser.
[I] Ruthenium and palladium, or both, may be added to Grade 19 for enhanced corrosion resistance as negotiated between purchaser and vendor. Chemical analysis is not required unless specifically required by the purchaser.